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CLEAN VERSION WITH AMENDMENTS. 11 TH NOV. 2003.

SPECIFICATION.

TITLE OF INVENTION: MULTI KNIFE CUTTING DEVICE

Embodiment 1 . Rotary action.

Embodiment 2. Independent knife movement.

Embodiment 3. Inclined cutting action..

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REFERENCE: This non-provisional application corresponds to provisional application number 60/ 300,605, dated June 25th 2001.

CROSS REFERENCE TO RELATED APPLICATIONS

Not applicable as this is a provisional application.

However I would like to mention that my application no.98/MAS/2001 dated 5th Feb 2001 is pending with the Patent office, Chennai, for the same invention. Several improvements and modifications, which are a result of testing the prototypes after Feb 1st 2001, have been included in the US application.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH- Not Applicable

REFERENCE TO A MICRO FICHE APPENDIX -

Not applicable

BACKGROUND OF THE INVENTION

The invention described in this application belongs to the field of kitchen gadgets for cutting which are labor saving. The subject matter of the invention falls under the U.S. patent classification "083 - CUTTING".

I am listing below some US patents which I came across during a search in the database.

The devices, which I have invented, have no similarities with these.

<u>US Patent no.</u>	<u>Title</u>
6,148,704	Vegetable cutting device
6,052,910	Vegetable cutting device
5,950,515	Apparatus for slicing vegetables

There are some more patented multi knife devices, a list of which is enclosed.

The components used are knives, levers, springs, fasteners, stainless steel structurals, wooden board, plastic parts etc, which are items in common use. They have been assembled in a novel way to obtain an improved device for cutting.

The prior art is cutting Vegetables with 1) a utility knife 2) Crank operated rotary cutter 3) a vertical knife fixed to a 50x 100x 500 mm wooden base.

The problems in cutting vegetables with a standard utility knife are well known and are listed below.

- Skill development to ensure cutting is done without hurting the finger.
- Pressure related strain on the hand.
- Slow and tedious work which is repetitive

- Knife touching the board causing scratches
- Problem of excessive effort in cutting hard vegetables
- Danger of knife slipping
- Cutting finger chips is laborious
- Both hands are to be used, one for holding, one for cutting
- Reluctance to do the job as it is tedious work.
- Getting uniform size is difficult
- Damage to knife handle due to constant pressure.

Problems in the prior art of multi knife devices.

Buckling of knives,

Vegetables remaining stuck between the knives,

Sliding of vegetables,

Knife frames increasing the load arm and reducing the lever advantage.

This invention should not be compared with food processors as they are motorized and the type of cutting is not comparable.

The Rotary type manual devices for vegetable cutting are also not comparable as sheet metal slits are used for cutting and they cannot be compared to knives for cutting quality.

I was motivated to invent a more productive mechanism after seeing the drudgery inherent in cutting vegetables especially if one happens to be a vegetarian.

BRIEF SUMMARY

The invention comprises a multi knife assembly, a base cum guide and a means of connection between them. Lever action is made use of to reduce cutting effort.

The object of the invention is to provide a trouble free multi knife cutting device which is time and labor saving.

Three embodiments will be described in the following pages.

Embodiment 1. Multi knife cutting device , Rotary action,

Embodiment 2. Multi knife cutting device, independent knife movement,

Embodiment 3. Multi knife cutting device, inclined cutting action.

The advantages are: -

- * The increase in productivity
- The time saving.
- Increased safety
- No fear of cutting fingers

- Even unskilled persons can do the job after a few minutes training
- Uniformity in size
- Use of lever action to gain mechanical advantage
- Elimination of pressure induced injuries on the knife holding fingers
- As the time taken is reduced, it results in cost reduction.

The improvements in the invention are :

There is no buckling or misalignment of knives due to improved guiding,

Sliding of vegetables is prevented,

The cut pieces do not remain stuck between the knives after the cut,

The device is compact and sturdy using proper knives.

<u>Sheet no.</u>	<u>Fig.no.</u>	<u>Details</u>
1 / 3	1	Elevation – rotary knife assembly
1 / 3	2	Plan ----- rotary knife assembly
1 / 3	3	Section XX, fig 4
1 / 3	4	Plan view, base cum guide, rotary action embodiment
2 / 3	5	Elevation – Independent action embodiment
2 / 3	6	Plan - do -
3 / 3	7	Elevation – Inclined cutting action embodiment
3 / 3	8	End view of base cum guide in direction A.

DETAILED DESCRIPTION OF THE MULTI KNIFE CUTTING DEVICE AND THREE EMBODIMENTS.

EMBODIMENT 1. MULTI KNIFE CUTTING DEVICE , ROTARY ACTION.

Fig. No.1. Elevation of rotary knife assembly

Fig.no. 2. Plan view, rotary knife assembly,

Fig. No. 3. Sectio XX,of fig.no.4,

Fig.no. 4. Plan view , base cum guide.

Construction details

This embodiment of the invention uses an assembly of rotary knives instead of straight knives along with a specially designed ~~baseboard~~ base cum guide to accomplish the task of cutting vegetables ~~or other materials~~. Stand alone knife assembly cannot perform the task. This device is meant for light work because of the features of the design.

Six ~~circular~~ rotary knives part 1 of 0.6 mm thickness and 72 mm diameter are held together by a 4mm bolt at location number 4 as shown in Fig 11 and 12- 1 and 2. The knives are made from grade 420 Stainless Steel. There is a gap of 12 mm between the knives as illustrated in

Fig 12 2. The handle 2 extends beyond the fulcrum 4. A spacer 3, 1.2 mm thick is inserted between handles to facilitate play for the knives to rotate. Bolts shown at location 5 hold the handles together. The handles are 11mm thick, 20mm wide and 190mm long, made of wood or plastic.

The board base cum guide part 7 (20x135x260mm), which can be made of plastic or wood is designed to guide the knives during rolling and separate the cut pieces from the knives after the cutting is over. There are six grooves part 8 in the board 7 as shown in figure no 14- 4. Each groove is 5 mm deep and 1.2 mm wide and runs all through the board length. There is an end stop cum guide with slots part 6 (20x40x135mm) made of wood and screwed to the board part 7 at the end as shown in fig 14- fig 4. It has vertical slots 1.2 mm wide corresponding with the grooves in the board.

Functional description

The vegetables are spread on the board base cum guide before the end stop 6 Fig 14- 4. The roller knife assembly part 1 is placed in the grooves 8 and is rolled over the vegetables simultaneously applying downward force. The assembly 1 is pulled towards the slot in the end stop till the knives pass through the slot. The end stop separates the cut pieces from between the knives. The handle extension in the front of the knife prevents the cut pieces from traveling with the knife. With this single operation all the vegetables are cut into small pieces and get separated from the knives. This operation is several times faster than using a single roller knife. This device is meant for cutting items, which are not hard for example okra, beans etc.

The use of rotary action knives for vegetable cutting is a novel feature.

EMBODIMENT 2.

MULTI KNIFE CUTTING DEVICE, INDEPENDENT KNIFE MOVEMENT.

Figure- 5 Elevation view

Figure- 6 Plan view.

Construction details.

Part 1	Support	3x30x65 mm	st. steel
Part 2	bolt for knife assembly	6x90 mm	st. steel
Part 3	slotted platform <u>guide with slots</u>	48x52x100 mm	Plastic
Part 4	Knife	1x25x160 mm	St. steel gr. 420

Part 5	<u>Support End stop</u>	20x30x75 mm	Plastic
Part 6	Knife handle	6x25x100 mm	Plastic
Part 7	<u>Base board cum guide</u>	20x75x270 mm	wood/plastic
Part 8	Spacer	6x8 mm	different lengths

The supports part 1 are screwed on to the board part 7 at one end as shown in fig 5 adjacent to the guide with slots part 3, containing 6 slots 3 mm wide.

Part 3 is stuck to the base cum guide with adhesive at the location shown in fig 4-5. The six knives part 4 fitted with handles part 6, are fitted to the supports 1 using the bolt and spacers, part 2 and 8 so that the knives align with the slots in platform part 3. The end stop part 5 determines the position of the knife, leaving a clearance below and above the knife at the end of the stroke. The vertical position is the starting position of the knives wherein, the knives are partly in the slots due to the close proximity of the knife fulcrum to the slots.

Functional description.

The whole potato is placed on the platform of part 3 close to the raised edge at one end designed to stop vegetable sliding, with the knives part 4 in vertical position. Then the knives are brought down and touch the potato top. The center distance between the knives is 8mm. To cut the potato into slices the knives are brought down in quick succession into the slots.

It is also possible to use two outer knives simultaneously without causing over load. It is not advisable to bring down all the knives simultaneously as the potato is large in size, which will cause the knives to bend sideways. This device is safer than single knife as the fingers are away from the knife. The device is also faster as all the knives are ready for cutting and there is no upward stroke for each knife cut separately. The slices are uniform giving better appearance.

This device can also be used for cutting of Okra, beans and slices of potato into small pieces by using all knives simultaneously. In this case the knives do not bend as the vegetable thickness is small compared to a whole potato. This device can be classified as multi purpose as the knives can be used separately or simultaneously depending on the thickness of the item being cut.

Improvements : The mounting of knives without using a separate knife frame reduces the load arm of the lever. The knife guiding is continuous as part of the knives are in the slot of the guide from the starting position, which results in trouble free cutting. The guide slots stop the cut pieces from traveling with the knives, when the knives go below the top surface of the guide with slots at the end of cutting stroke.

EMBODIMENT 3. MULTI KNIFE CUTTING DEVICE. INCLINED CUTTING ACTION.

This embodiment was first described in my letter to you on 30 th Jan 2003, requesting you to inform the procedure for it's inclusion. Then it was named Multi knife cutting device, inclined cutting action. I have written more on this in my introduction to the present amendments. This is the best mode considering compactness, and versatility in operation.

Fig.no. 7. Elevation view, knives horizontal, dotted lines show knives vertical position.

Fig.no. 8. End view of base cum guide without knives, direction A fig.7.

Part no.	Name	Quantity	Material.	Dimension in mm
1	Knife	6	SS 420	1x 24x160
2	screw	12	steel	4 dia
3	handle	2	Al/laminate	6x24x170
4	fulcrum screw	1	steel	4 dia
5	<u>Platform</u>			
	<u>Vegetable enclosure</u>	1	Al/ laminate	---
6	Guides/separators	7	Al/laminate	6x129 ht
7	base angle	2	Al	2x20x25
8	Spacers	6	laminate	2x20x76
9	Slots for knives	6	--	2 wide
10	screws	2	steel	4 dia

Construction.

The appearance is shown in fig nos 7and 8

Six numbers of knives part 1 are mounted in a ~~frame~~ base cum guide made up of part 6 guides, part 7 base angle, spacers part 8, and part 10 screws to join them together into a ~~frame.~~ base cum guide.

The knives are joined to the base cum guide by a 4mm screw at location marked 4. The screw acts as a Fulcrum for the movement of the knives. The slot in which the knife is mounted is 2mm wide and the knife is 1 mm thick. The 1 mm gap is filled up by a 1mm thick and 24mm dia laminate washers, 6 nos,on the fulcrum screw. This makes the knives move without play and function better. The outer 4 knives are assembled into one handle ,part3,170 mm long and the center 2 knives are assembled into another handle. These two groups of knives can be operated together or separately .

The guides part 6 form an enclosure of 60 x 60 mm ,the bottom surface of which is the support platform for the vegetables.

Functional description.

The device is placed on a flat surface as shown if fig 22.

The 6 knives are taken back by about 45 degrees from the vertical position forming a gap between the knives and the platform. The vegetables are placed on the platform. The knives are moved clockwise by hand pressing at the extreme end of the two handles to gain maximum lever advantage. The stroke comes to an end in the horizontal position after slicing through the vegetables touching the end stop part 11.

The cut pieces are lying free on the platform and can be removed by pushing with a wooden piece or by tilting the whole device to the right.

Now the device is ready for the next cutting operation.

This embodiment is the best mode because of the following.

- The knives are guided through the full cutting operation by the guides part 6 preventing them from bending so that the cutting is smooth.
- It can cut a full potato of section 60 x 60 mm into slices or fingers as the knives are supported on the sides. For this operation the outer four knives are to be used first for cutting while the center two knives are pressing the potato in the middle. The center knives can be pushed down immediately after the outer knives become horizontal.
- For light cutting jobs like 6 nos Okra at a time all the 6 knives can be used simultaneously saving time.

The distinctive features of this embodiment are ;

Direct mounting of the knives in the guide with slots, eliminating a frame,

Vegetable enclosure giving positive support to the vegetables from sliding,

End stop part 11 stopping the knives before the edges touch the base,

Knives entering guide slots below the vegetables, leaving the cut pieces free.

OTHER DESIGN VARIATIONS WITH THE SAME PRINCIPLE

The description of three embodiments in the preceding pages is considered as an illustration of the design principles of the invention and is not an exhaustive collection of all the variations.

The invention is not limited to the three embodiments described in this application. All feasible modifications and variations within the scope of the invention may be resorted to in due course.

Illustrative variations are :

Attachment of a board to the inclined action embodiment in level with the vegetable enclosure to support the extra length of the vegetables ;

Using the above embodiment with the knives stationary and the base cum guide moving against them for the cut ;

Changing the number and size of knives ;

Using double edged knives with vegetable enclosures on either side of the knives ;

Converting the inclined motion of the knives into vertical motion using telescopic guides between the knife assembly and the base cum guide ;

Motorizing the lever action of embodiment using reduction gear box;

Introducing spring return mechanism to the lever element .

ABSTRACT OF THE DISCLOSURE

The invention comprises, a guide cum base, an assembly of six knives and a connection mechanism to form a multi knife cutting device.

The improved features are :

Elimination of knife frame, increasing mechanical advantage,

Positive guiding to the knives minimizing buckling and misalignment,

Design of knife slots to prevent cut pieces from remaining between the knives,

Elimination of vegetable sliding,

Flexible selection of the knives to suit whole potato or French beans which offer different resistance.